

8-4 NONROUTINE PROBLEMS OPEN MIDDLE PROBLEMS

Use any of the integers -9 to 9 at most once in each table below.

1. Create an input-output table for:

a. any linear function

x				
y				

b. any non-linear function
("piecewise" linear is okay)

x				
y				

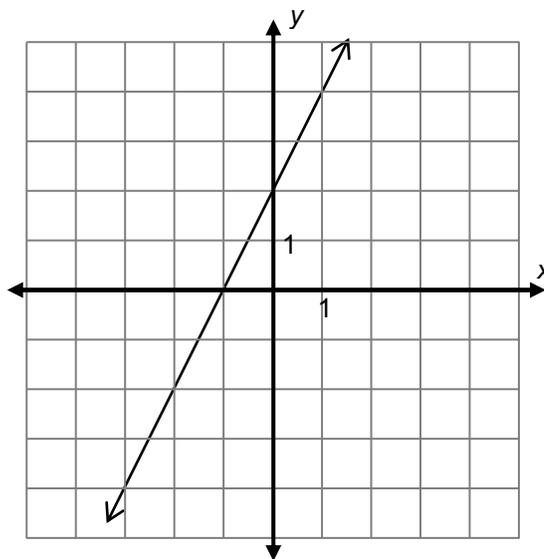
2. For the given graphed line and directions, create input-output values in the tables. Graph some ordered pairs to demonstrate that they are along the type of lines required.

a. a line that is "steeper" than the pictured line.

x				
y				

b. a line that is "flatter" than the pictured line.

x				
y				



3. Why is it impossible to create an input-output table that does not represent a function?

8-4 NONROUTINE PROBLEMS IS IT A FUNCTION?

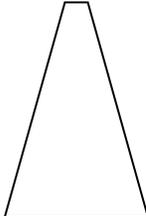
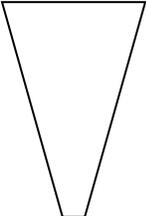
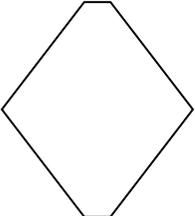
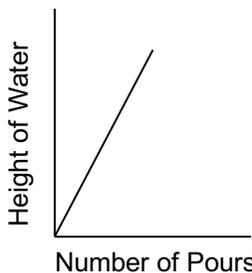
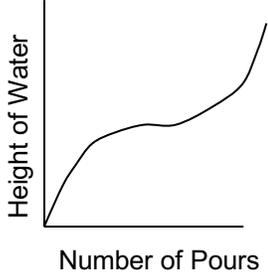
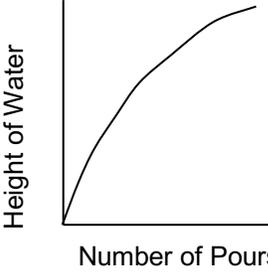
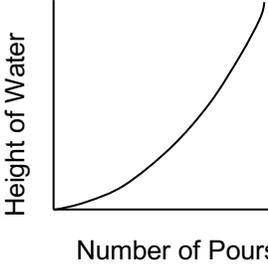
Below are different representations of sets of ordered pairs. Circle the ones that appear to represent functions. If it is **not** a function, change it to represent one.

<p>1.</p> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">1</td><td style="padding: 2px 10px;">-2</td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="padding: 2px 10px;">-2</td></tr> <tr><td style="padding: 2px 10px;">3</td><td style="padding: 2px 10px;">-2</td></tr> <tr><td style="padding: 2px 10px;">4</td><td style="padding: 2px 10px;">-2</td></tr> </tbody> </table>	x	y	1	-2	2	-2	3	-2	4	-2	<p>2.</p>	<p>3.</p>
x	y											
1	-2											
2	-2											
3	-2											
4	-2											
<p>4.</p>	<p>5.</p>	<p>6.</p> <p style="text-align: center;">(6,3), (3,6), (-3,-6), (-6,-3)</p>										
<p>7.</p> <p style="text-align: center;">{(4,3), (4,4), (4,5), (4,6)}</p>	<p>8.</p>	<p>9.</p> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">5</td><td style="padding: 2px 10px;">4</td></tr> <tr><td style="padding: 2px 10px;">5</td><td style="padding: 2px 10px;">4</td></tr> <tr><td style="padding: 2px 10px;">6</td><td style="padding: 2px 10px;">7</td></tr> <tr><td style="padding: 2px 10px;">7</td><td style="padding: 2px 10px;">8</td></tr> </tbody> </table>	x	y	5	4	5	4	6	7	7	8
x	y											
5	4											
5	4											
6	7											
7	8											
<p>10.</p>	<p>11.</p> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">-2</td><td style="padding: 2px 10px;">1</td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="padding: 2px 10px;">4</td></tr> <tr><td style="padding: 2px 10px;">-2</td><td style="padding: 2px 10px;">3</td></tr> <tr><td style="padding: 2px 10px;">0</td><td style="padding: 2px 10px;">-6</td></tr> </tbody> </table>	x	y	-2	1	2	4	-2	3	0	-6	<p>12.</p> <p style="text-align: center;">(4,3), (2,5), (1,8), (0,3)</p>
x	y											
-2	1											
2	4											
-2	3											
0	-6											

8-4 NONROUTINE PROBLEMS POURING WATER

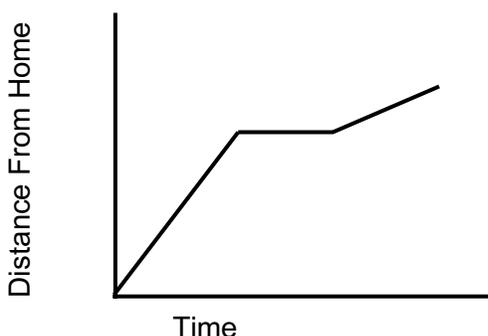
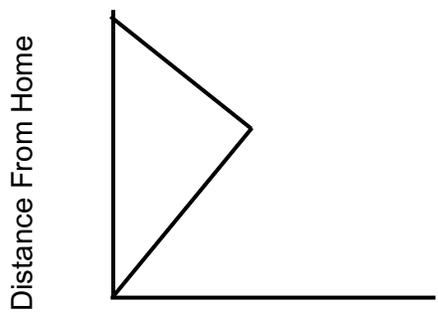
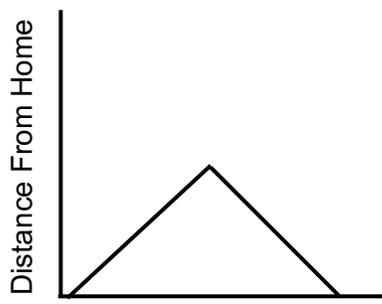
Imagine pouring water into each of these containers at a constant rate.

- Match each container with an appropriate graph below.
- Write one or two sentences to justify each choice.

<p>1. Container 1</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>	<p>2. Container 2</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>		
<p>3. Container 3</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>	<p>4. Container 4</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>		
<p>A.</p> <div style="text-align: center;">  </div>	<p>B.</p> <div style="text-align: center;">  </div>	<p>C.</p> <div style="text-align: center;">  </div>	<p>D.</p> <div style="text-align: center;">  </div>

8-4 NONROUTINE PROBLEMS RUNNING STORIES

Create stories about walking or running that each graph could represent. If the situation is not possible, explain. Include appropriate scales if using numbers to describe the story.

Graph	Story
<p>A.</p>  <p style="text-align: center;">Time</p>	
<p>B.</p>  <p style="text-align: center;">Time</p>	
<p>C.</p>  <p style="text-align: center;">Time</p>	

8-4 NONROUTINE PROBLEMS MIXED PROBLEMS

1. The table below represents a function where x is the input value and y is the output value.

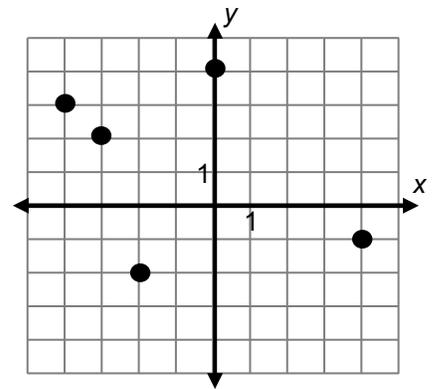
x	-3	-2	0	2
y	7	5	1	-3

Select ALL ordered pairs that could be included in the table so that it remains a function.

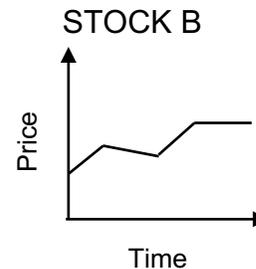
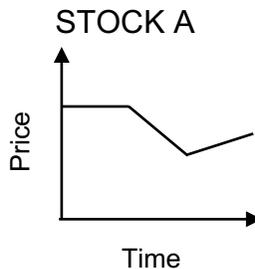
- a. (0, 0) b. (5, -2) c. (1, 1)
 d. (2, 3) e. (7, 0) f. (-3, 4)

2. The graph to the right represents y as a function of x . Which additional point can be plotted so that the graph continues to represent y as a function of x ?

- a. (0,1) b. (1,0) c. (4,2) d. (-2, 4)



3. The graphs below show the prices of two stocks during one day. Assume that they are scaled the same.



- a. Make two comparisons from the graphs.
 b. Explain which stock, if either, you would choose to buy as an investment.

8-4 NONROUTINE PROBLEMS MIXED PROBLEMS Continued

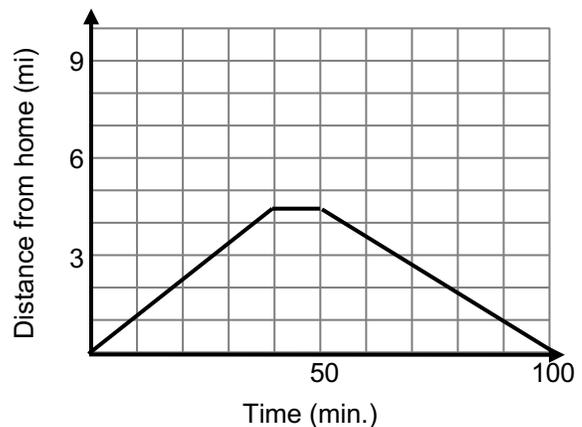
4. Determine which equations define y as a linear function of x , and which equations define y as a non-linear function of x . Consider using a table of values or a graphing calculator.

Equation	Linear Function	Non-Linear Function
$y = 1.2x^2$		
$2y = x$		
$x + y = 7$		
$y = 4x + 3^2$		
$y = 4 + 3x^2$		
$y = 2x^3 - 1$		
$y = \frac{x}{5}$		

5. The graph to the right shows a runner's distance from home over time.

Based on the graph, determine whether each statement is true or false.

- a. The runner's distance from home is increasing between 40 minutes and 50 minutes.
- b. The runner's distance from home is increasing from 10 minutes to 40 minutes.
- c. The runner's distance from home is increasing from 50 minutes to 100 minutes.
- d. The runner ran at a constant speed the entire time.



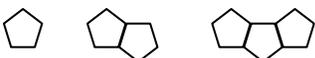
8-4 NONROUTINE PROBLEMS FROM THE MATH OLYMPIAD

1. A cricket chirps 6 times every 8 seconds. At that rate, how many times does the cricket chirp in 2 minutes?

2. If 4 people can paint 2 fences in 5 hours, how many hours will it take for 8 people to paint 8 fences?

3. Suppose that toothpicks are used to make rows of figures. Rows of 1, 2, and 3 figures are pictured for some figures below. There is one toothpick per side. How many toothpicks are needed for a row with 100 figures?

a. squares 

b. pentagons 

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